

MENGZHE RUAN

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🎓 EDUCATION

City University of Hong Kong (CityU), Hong Kong, China 2020.8 – Present

Ph.D. student in Computer Science (CS)

Expected graduate in Mar. 2025, Supervisor: Dr. XU Weitao

Sichuan University, Sichuan, China 2016.9 – 2020.6

Bachelor Degree in Computer Science (CS) and Financial Engineering (FE)

Computational Finance Experimental Class in *Wu Yuzhang Honors College*, 86.8/100

👥 CONFERENCE

Adaptive Top-K in SGD for Communication-Efficient Distributed Learning

Mengzhe Ruan, Guangfeng Yan, Yuanzhang Xiao, Linqi Song, Weitao Xu

Presentation, Proceedings of 2023 IEEE Global Communications Conference: Communication Theory

👥 JOURNAL

Adaptive Top-K in SGD for Communication-Efficient Distributed Learning in Multi-Robot Collaboration

Mengzhe Ruan, Guangfeng Yan, Yuanzhang Xiao, Linqi Song, Weitao Xu

IEEE Journal of Selected Topics in Signal Processing (JSTSP), part was presented at *Globecom 2023*.

mmSign: mmWave-based Few-Shot Online Handwritten Signature Verification

Mingda Han, Huanqi Yang, Tao Ni, Di Duan, **Mengzhe Ruan**, Yongliang Chen, Jia Zhang, Weitao Xu

ACM Transactions on Sensor Network (ToSN, CCF B)

👥 WORKING (INTERN) EXPERIENCE

Qilin Investment (AUM about 20-30 billion CNY), Shanghai, China 2024.2 – 2024.3

Quantitative Researcher Intern (Machine Learning)

Brief introduction: Utilizing the company's powerful factor library, we have intensively researched and experimented with a variety of deep learning architectures, mainly including Recurrent Neural Networks (RNN) and Transformer models, focusing on time series forecasting.

Model Optimization: By adjusting the model structure and hyper-parameter optimization (e.g., time step, number of network layers), we have significantly improved the performance of the forecasting model.

Performance Improvement: In a simulated trading environment, a novel stock return forecasting model was successfully designed and implemented, which achieved a long-short return (LSPnL) enhancement of about 15%, outperforming the previous benchmark model, while the information coefficient (IC) remained stable.

Huawei Technologies 2012 Labs, Hangzhou, China 2023.11 – 2024.2

AI (Machine Learning) Engineer Intern

Brief introduction: In-depth study of distributed aggregate communication algorithms, such as NCCL, analyzing their code structure and algorithm design, focusing on their GPU topology analysis in large-scale deep learning training, and attempting to optimize them.

Algorithmic research: In-depth analysis of Parameter Server architecture algorithms (e.g., BytePS), combined with gradient compression techniques, can significantly reduce the communication latency and improve the data transmission efficiency.

Academic contribution: systematically organize and summarize the latest research results on high performance networking and distributed computing in top conferences such as SIGCOMM and HiPC, which provide references for further research in the lab.

RESEARCH EXPERIENCE

City University of Hong Kong, Hong Kong, China 2022.4 – 2024.3

Ph. D. Supervisor: Dr. XU Weitao, Dr. SONG Linqi and Dr. XIAO Yuanzhang (University of Hawaii at Manoa)

Brief introduction: We proposed an adaptive gradient compression algorithm to solve the communication bottleneck in communication-efficient machine learning. I derived convergence rate for Adaptive TopK compression in distributed setting and solve that optimization problem to maximize the convergence rate under same communication costs. This work has been ACCEPTED for presentation at Globecom 2023. We also add the accelerated optimization methods and error compensation to our previous research. We give more general theoretical proof to prove the convergence for a class of adaptive communication efficient methods. The journal paper has been accepted by IEEE Journal of Selected Topics in Signal Processing.

Hong Kong University of Science and Technology, Hong Kong, China 2021.12 – 2022.6

Visiting PhD student Supervisor: Dr. CAO Xuanyu (HKUST)

Brief introduction: We focuses on the design of communication power control in decentralized distributed learning, aiming to optimize the communication efficiency and the convergence performance of the learning algorithm. The optimal convergence gap of the overall loss function under different communication rounds is successfully derived, and the effect of gradient aggregation error on the learning process is quantified. It is planned to de-design the optimization algorithm to adjust the sending power based on the derivation results to achieve a better convergence rate.

COMPETITION EXPERIENCE

The Fourth Place

Infinity Champions 011 - Alphathon 2023 WORLDQUANT

Develop and submit 32 Alphas with Sharpe above 1.25 and Turnover rate within 70%, based on the Top 3000 stock Universe of USA and China totally.

National Second Prize

2018 China Undergraduate Mathematical Contest in Modeling

Meritorious Winner

2018 MCM/ICM (Mathematical Contest in Modeling/ Interdisciplinary Contest in Modeling)

TEACHING EXPERIENCE

Teaching Assistant

CityU, CS1302 Introduction to Computer Programming, 2020.9- Now

This course is mainly about Python programming, I was the Teaching Tutor for 4 semesters and the Teaching Assistant for 3 semesters.

SKILLS

- Programming Languages: Python >= MATLAB > C/C++ > Java

HONORS AND AWARDS

Gold Level (About Top 1.23%) in WORLDQUANT Brain Challenge	Until Dec. 2023
Individual First-Class Scholarship, Sichuan University	2018 – 2019
Postgraduate Studentship by UGC, City University of Hong Kong	2020 – 2024